UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/567,124	02/06/2006	Miyuki Tsukioka	126928	2903

25944 7590 01/07/2010

OLIFF & BERRIDGE, PLC
P.O. BOX 320850
ALEXANDRIA, VA 22320-4850

EXAMINER	
CLARK, GREGORY D	

ART UNIT	PAPER NUMBER
1794	

MAIL DATE	DELIVERY MODE
01/07/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/567,124	TSUKIOKA ET AL.	
	Examiner	Art Unit	
	GREGORY CLARK	1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 October 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The examiner acknowledges the receipt of the applicants' remarks dated 10/13/2009. Claims 1-13 pending.

Rejections and objections made in previous office action that do not appear below have been overcome by applicant's amendments and therefore the arguments pertaining to these rejections/objections will not be addressed.

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

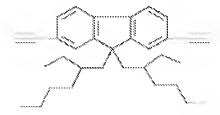
> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. **Claims1-3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhan (J. Mat. Chem.), (2001) 11, p1606-1611).**

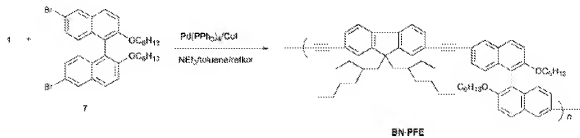
3. **Regarding Claims 1-3,** Zhan discloses a light emitting poly(aryleneethynylene) based on a fluorene (Zhan fluorene structure 1 shown below). Zhan further discloses that the electronic structures and photo and electroluminescent (EL) properties of these polymers can be manipulated by simply varying the nature of the co-units in the polymeric chain (abstract).

Zhan discloses fluorene structure 1 that a structural isomer applicants' formula 1b in claim 1 and formula 3 in claim 3. Zhan also discloses the sterically hindered non-planar dinaphthyl (aryl) unit (structural isomer to applicants' formula 1a in claim 1 and formula 2 in claim 2).

Zhan Structures shown below:

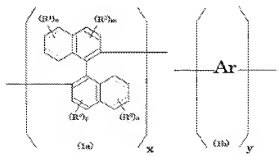


1

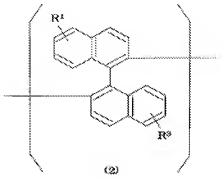


7 BN-PFE

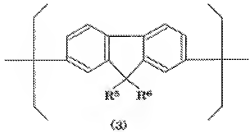
Applicants' Structures shown below:



Claim 1 structure



Claim 2 structure



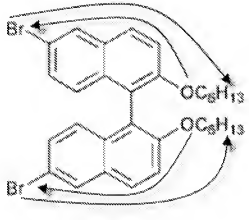
Claim 3 structure

Structure 1 (shown above) disclosed by Zhan reads on formula 1b and formula 3 from applicants' claims 1 and 3. respectively. The copolymerization of structures 1 and 7 disclosed by Zhan (shown above) result in a poly(aryleneethynylene) dinaphthyl copolymer (BN-PFE) which is similar to the copolymer formed by combining applicants' structure 2 (in claim 2) and structure 3 (in claim 3).

The dinaphthyl unit disclosed by Zhan differs from the dinaphthyl unit claimed by the applicant in that the locations of the polymerizable groups taught by the applicant are ortho (next to) the ring carbons in each naphthyl unit that are directly bonded to the opposite naphthyl ring. These are merely structural isomers.

The dinaphthyl unit disclosed by Zhan has the polymerizable groups positioned on the adjacent ring as opposed to being positioned on the ring that is directly attached to the other naphthyl unit.

A person of ordinary skill in the art at the time of the invention would synthesize structural isomers of precursor structure 7 disclosed by Zhan that when polymerized with the fluorene unit would result in a copolymer that reads directly on the applicants' claim. The process would involve synthesizing a naphthyl precursor molecule where the positions of hexoxy ($C_6H_{13}O$-) groups and Br groups on each naphthyl ring were reversed in terms of their position on the each naphthyl unit (see structure below).



7

Such a synthetic variation would result in a precursor that when copolymerized with the fluorene unit would result in a copolymer similar to that claimed by the applicant. Zhan indicates that the electronic structures and photo- and electroluminescent (EL) properties of these polymers can be manipulated by simply varying the nature of the co-units in the polymeric chain (abstract). The examiner

interprets " manipulated by simply varying the nature of the co-units " to include where the reactive or polymerization groups are positioned on the aromatic rings. Positioning the Br groups ortho (next to) to the central ring carbons in each naphthyl unit that is directly bonded to the opposite naphthyl unit would be well within the scope of a skilled artisan.

Since the essential difference between the polymer taught by Zhan and the polymer claimed is the point of attachment on the napthyl unit, one would expect that a structural isomer would act in substantially in the same capacity. Furthermore, changing the structure of the isomer would be well within the ordinary skill of the art.

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the structure of Zhan to produce the structural isomer having the claimed napthyl linkage with a reasonable expectation of success, and it would have been obvious to one having ordinary skill in the art to try different structural isomers.

5. **Regarding Claims 4, 8-9,** Zhan indicates that the electronic structures and photo- and electroluminescent (EL) properties of these polymers can be manipulated by simply varying the nature of the co-units in the polymeric chain and the spectral emission varies depending on the composition of the copolymers (abstract). Zhan does not teach an electroluminescence polymer wherein X is in a range from 0.1 to 90mol%.

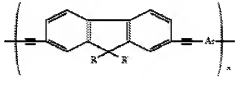
Whereas, Zhan does not teach the range disclosed by the applicant, he clearly discloses that electroluminescent properties can be manipulated by varying the

copolymer composition. With the expectation of success, at the time of the invention a person of ordinary skill in the art would simply vary the mol % of the X unit to achieve the desired emission properties. This would include the range claimed by the applicant.

6. **Claims 5 and 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhan (J. Mat. Chem. (2001) 11, p1606-1611) in view of Kim (5,876,864).**

7. **Regarding Claims 5,** Zhan discloses poly(aryleneethynylene) and fluorene copolymers with two repeat units. Zhen does not teach electroluminescent polymers with three repeat units.

Kim discloses fluorene based alternating polymers having the following formula (I) (shown below) to be used as light emitting materials of electroluminescent elements, and further relates to electroluminescent elements having an anode/luminescent layer/cathode structure, in which the fluorene -based alternating polymer is used as light emitting materials of the luminescent layer (abstract).



1

Kim further discloses that the Ar group can represent diphenyl, diphenylamine, naphthalene, anthracene, phenanthrene; heterocyclic compound such as pyridine, carbazole, and diphenylmethane (column 4, lines 35-45).

Although Kim does not teach electroluminescent polymers with three repeats unit, he clearly shows that the Ar units which constitute the third repeat unit of the polymer of claim 5 were known in the art in context of copolymerizable units that are fully capable of reacting were the fluorene ring system to make materials that function as electroluminescent polymers.

An electroluminescent copolymer with three repeat units is simply achieved by combining three reactive species (i.e., a fluorene, a carbazole, and a dinaphthyl) to a ter-polymer. The resultant ter-polymer would be considered as additive in nature achieved by the addition of another reactive unit and thus an obvious variant from the types of electroluminescent polymer disclosed by Zhan and Kim, absent unexpected results.

Kim discloses that electroluminescent elements having an anode/luminescent layer/cathode structure, in which the fluorene-based alternating polymer is used as light emitting materials of the luminescent layer (abstract) (per claim 6).

8. **Regarding Claims 6-7, 10-13,** Zhan discloses that dinaphthyl and fluorene copolymers are used as electroluminescent polymers but fails to mention the structure of a device that incorporated such polymers. Kim teaches similar electroluminescent polymers and gives the following structure: electroluminescent elements having an anode/luminescent layer/cathode structure (per claims 6, 10-13), in which the fluorene - based alternating polymer is used as light emitting materials of the luminescent layer

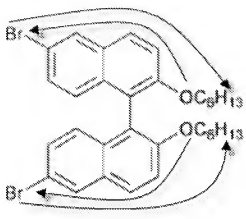
(abstract) and such materials are used in flat panel color display devices (column 1, lines 45-46)(per claim 7).

Zhan and Kim teach similar electroluminescent polymers and the polymers disclosed by Zhan would be suitable for the structure taught by Kim that reads on applicants' claim 6.

Response to Arguments

The applicant argues that it would not have been obvious to modify the formula 7 of Zhan to achieve applicants' formula 1a.

The examiner maintains that a person of ordinary skill in the art at the time of the invention would synthesize structural isomers of precursor structure 7 that when polymerized with the fluorene unit would result in a copolymer that reads directly on the applicants' claim. Synthesizing a naphthyl precursor molecule where the positions of hexoxy ($C_6H_{13}0$-) groups and Br groups on each naphthyl ring were reversed in terms of their position on the each naphthyl unit (see structure below) would have been an obvious.



7

Such a synthetic variation would result in a precursor that when copolymerized with the fluorene unit would result in a copolymer similar to that claimed by the applicant. Zhan indicates that the electronic structures and photo- and electroluminescent (EL) properties of these polymers can be manipulated by simply varying the nature of the co-units in the polymeric chain (abstract). The resulting copolymers would be expected to have similar electronic properties and such copolymers would have merely been structural isomers of the polymers claimed by the applicant.

The applicant argues that Zhan is concerned with not significantly increasing the steric interactions in the polymer backbone.

The examiner counters that Zhan does not teach away from steric interactions because Zhan introduces sterically hindered substituents to affect the polymer main chain to improve the EL efficiency (page 1606, column 2). As Zhan does not teach away from main chain rigidity, it would have been obvious to achieve increased steric

interactions in the polymer backbone by making copolymers (isomers) with 2, 2' attachment sites since Zhan teaches that main chain rigidity improve the EL efficiency.

The applicant argues that when the interaction between the fluorene derivative structural units increases the emission shifts from blue to green and when the interaction between the fluorene derivative structural units decreases the original blue color is made stronger.

The examiner counters that it would have been obvious to a person of ordinary skill in the art to have made a number of structural isomers with main chain rigidity to improve EL efficiency based on the guidance of Zhan. The examiner also notes that differences in emission color and intensity is not included in the claim limitations.

Applicant's arguments filed 10/13/2009 have been fully considered but they are not persuasive.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GREGORY CLARK whose telephone number is (571)270-7087. The examiner can normally be reached on M-Th 7:00 AM to 5 PM Alternating Fri 7:30 AM to 4 PM and Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Larry Tarazano can be reached on (571) 272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. Lawrence Tarazano/
Supervisory Patent Examiner, Art Unit 1794

GREGORY CLARK
Examiner
Art Unit 1794